

## 28-Final Keyword

### Final Keyword in Java

The final keyword in Java is used to restrict the modification of variables, methods, and classes. It plays a crucial role in defining constants and preventing inheritance or method overriding. Let's explore how final can be used in different contexts:

#### 1. Final Variable

A variable declared with the final keyword cannot be modified once it is initialized. This makes the variable effectively a constant.

#### Explanation:

```
1 public class Demo {  
2     public static void main(String[] args) {  
3         final int num = 8;  
4         num = 9; // This will cause a compile-time error  
5         System.out.println(num); // Output: 8  
6     }  
7 }  
8
```

Output:

```
Demo.java:4: error: cannot assign a value to final variable num  
    num = 9; // This will cause a compile-time error  
    ^  
1 error
```

**Explanation:** Once num is declared as final, any attempt to change its value will result in a compilation error.

#### 2. Final Class

A class declared as final cannot be extended (inherited). This is useful when you want to prevent other classes from inheriting and modifying its behavior.

### Example:

```
1 final class Calc {
2     public void show() {
3         System.out.println("In Calc's show method");
4     }
5
6     public void add(int a, int b) {
7         System.out.println("Addition is: " + (a + b));
8     }
9 }
10 class AdvCalc extends Calc {
11     // This will cause a compile-time error
12     // As class AdvCalc extends Calc { }
13 }
14 public class Demo {
15     public static void main(String[] args) {
16         Calc obj=new Calc();
17         obj.show();
18         obj.add(5,4);
19     }
20 }
21
22 }
23 }
24
```

Output:

```
Demo.java:10: error: cannot inherit from final Calc
class AdvCalc extends Calc {
                        ^
1 error
```

**Explanation:** The final keyword prevents the Calc class from being extended by any other class.

### 3. Final Method

A method declared with the final keyword cannot be overridden by subclasses. This ensures that the method's implementation remains unchanged in all derived classes.

### Example:

```
1 class Calc {
2     public final void show() {
3         System.out.println("By Navin");
4     }
5
6     public void add(int a, int b) {
7         System.out.println(a + b);
8     }
9 }
10
11 class AdvCalc extends Calc {
12     // This will cause a compile-time error
13     // public void show() { System.out.println("By John"); }
14 }
15
16 public class Demo {
17     public static void main(String[] args) {
18         AdvCalc obj = new AdvCalc();
19         obj.show(); // Output: By Navin
20         obj.add(5, 4); // Output: 9
21     }
22 }
23
```

### Output

Output	Generated Files
By Navin 9	

*Explanation:* The show method in Calc is marked as final, so it cannot be overridden by AdvCalc.

### Characteristics of final Keyword

- **Final Variables:** Once initialized, their value cannot be changed. This is useful for constants.

- **Final Methods:** These cannot be overridden, ensuring that the implementation stays consistent across all subclasses.
- **Final Classes:** These cannot be extended, which is useful when a class is meant to be used as-is without modification.
- **Initialization:** Final variables must be initialized when declared or within the constructor, ensuring they are assigned exactly once.
- **Performance:** Using final can improve performance as the compiler can optimize the code knowing that the value or method won't change.
- **Security:** The final keyword helps in protecting data and methods from being modified by malicious code.

## Conclusion

The final keyword in Java is a powerful tool for creating constants, preventing inheritance, and ensuring methods are not overridden. It provides security, performance, and clarity in the codebase by restricting unwanted modifications.

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## FAQs about the final Keyword in Java

### 1. What is a final method in Java?

A final method is a method that cannot be overridden by subclasses. It ensures that the method's behavior remains unchanged across the inheritance hierarchy.

### 2. Is a final method inherited?

Yes, a final method is inherited by the subclass, but it cannot be overridden or modified.

### 3. Can a final class be instantiated?

Yes, a final class can be instantiated, just like any other class. However, it cannot be extended.

### 4. What is the difference between final and static keywords in Java?

- **Final Keyword:** Used to declare variables, methods, or classes as unmodifiable.
- **Static Keyword:** Used to declare class members (variables and methods) that belong to the class itself, not to instances of the class.

### 5. Can we declare a String variable as final?

Yes, you can declare a String variable as final, which means that once it is initialized, it cannot be changed.